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First records of *Odontomantis* (Mantodea, Hymenopodidae) in Brazil, a new allochthonous species revealed by citizen science, with notes on possible adaptation and ecological interactions

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Abstract

Recent citizen science observations have documented the occurrence of the Asian mantid genus *Odontomantis* in Brazil, with records from the cities of Boa Vista (Roraima) and Manaus (Amazonas). This represents the first evidence of the genus in South America. All available data derive from photographic records provided by non-specialists, suggesting a recent introduction, although the introduction pathways and the role of human-mediated transport remain unknown. The presence of *Odontomantis* in urban environments raises questions regarding its ability to establish populations and its potential ecological effects. Urban habitats such as gardens, ornamental vegetation, and fragmented green areas may facilitate its persistence during early stages of colonization. Ecological similarities with native Neotropical mantids occupying comparable microhabitats suggest that interactions with local species could occur if the introduced populations expand beyond urban areas. The detection of *Odontomantis* in two geographically distant cities may indicate either multiple introduction events or early dispersal within Brazil. These findings highlight the importance of citizen science as an effective tool for detecting non-native invertebrates and underscore the need for continued monitoring to assess the distribution, habitat use, and potential ecological impact of *Odontomantis* in the Neotropics.

Keywords

Acanthopidae, Amazon, citizen science, Hymenopodidae, Odontomantis, urban ecology

Introduction

In recent decades, there has been a noticeable increase in the number of reports and documented cases of human-mediated introductions of Mantodea, a trend that reflects both a real expansion of certain species into new ranges and an increase in monitoring efforts and the visibility of such phenomena in the entomological literature (Shcherbakov and Govorov 2020). Much of the available knowledge derives from investigations carried out in temperate and subtropical regions where well-documented cases have emerged involving species of large size, relatively aggressive behavior, or broad trophic spectrum, such as *Hierodula* Burmeister, 1838, *Statilia* Stål, 1877, *Tenodera* Burmeister, 1838, *Sphodromantis* Stål, 1871, and *Miomantis* Saussure, 1870. In particular, the expansion and impact of *Miomantis caffra* Saussure, 1871 in Australia have been tracked and analyzed with substantial contributions from citizen science (Connors et al. 2022), while in North America and Europe, the historical and recent distribution of alien mantids has been synthesized through catalogs, field guides, and studies that facilitated identification and management (Anderson 2019, Moulin and Benaiche 2025). In contrast, the observed frequency of mantid introductions in tropical areas appears lower, but this is most likely the result of strong detection and publication bias due to limited monitoring and research networks.

Within this framework, the author reports here a novel case involving the genus *Odontomantis* Saussure, 1871, small ant-mimicking mantids distributed across Southeast Asia (Wu 2021a, Otte et al. 2025). The group currently includes about 20 species described from forested and anthropized habitats (Herlinda et al. 2019), with juveniles exhibiting striking ant-mimicking traits that may facilitate accidental transport through plant trade (Bragg 2021). Based on citizen science observations and verifiable material, the author documents for the first time the presence of *Odontomantis* specimens introduced and established in Brazil, specifically in the cities of Manaus (Amazonas) and Boa Vista (Roraima). The aim of this contribution is to provide the first record of the genus in South America, contextualize its occurrence, and discuss its potential significance in the broader scenario of mantid introductions.

Materials and methods

The present work draws upon both the examination of preserved specimens housed in entomological collections and extensive input from citizen scientists across several Southeast Asian nations. Observational records, accompanied by photographs, were sourced from biodiversity databases such as iNaturalist and GBIF and supplemented by systematic monitoring of posts on widely used social media platforms. On Facebook, relevant records were

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retrieved through participation in entomological identification groups, and on Instagram, additional data were gathered via a dedicated initiative titled *Mondo delle Mantidi* ("World of Mantids" in Italian). Through this network, the author engaged with non-specialist contributors directly in private chat channels provided by the platform. Contributors were requested to provide photographic evidence of the specimens, precise locality data, and contextual information about the habitat in which the individuals were encountered, such as whether the setting was urban or peri-urban. These submissions were carefully cross-checked against reference specimens in the author's personal collection, ensuring accurate morphological characterization of adult males and females. Macro photographs for this purpose were taken with a Nikon Coolpix B500 camera and subsequently refined using Adobe Photoshop. Morphological terminology follows the standards set forth by Brannoch et al. (2017). Geospatial analyses and the production of distribution maps for the recorded specimens were completed using QGIS version 3.34 Prizren.

Results

Material examined.—BRAZIL • 1 ♂; Roraima state, Boa Vista; Boa Vista airport; 2°49'57.5"N, 60°41'35.8"W; 90 m a.s.l.; 10 Jul. 2023; Whaldener Endo leg. https://www.inaturalist.org/observations/172176853

L • 1 subadult nymph ♂; Amazonas state, Manaus city, Ponta Negra; Tropical Executive Hotel; 3°03'50.0"S, 60°06'26.5"W; 24.3 m a.s.l.; 01 Mar. 2024; Bruno Correa leg. https://www.inaturalist.org/observations/200874997

• 1 ♀, 1 ootheca, 25 nymphs; Amazonas state, Manaus city, Cidade Nova, Av. Atroaris 08; 3°01'26.5"S, 59°59'21.6"W; 70.5 m a.s.l."; 23 Apr. 2024; Thalisson Torres leg. https://www.inaturalist.org/observations/208809591 • 1 ♀; Roraima state, Boa Vista city, Rua João Padeiro; 2°49'32.2"N, 60°42'25.7"W; 83.3 m a.s.l.; 01 Jun. 2024; Imaculada Ramalho leg. https://www.inaturalist.org/observations/219911919 • 1 nymph; Roraima state, Mucajaí; 2°26'56.6"N, 60°54'44.7"W; 84 m a.s.l.; 12 Oct. 2024; Natalia Jones leg. https://www.inaturalist.org/observations/246925121

BRAZIL • 1 nymph; Amazonas state, Manaus city, Adrianópolis neighborhood; 3°06'03.8"S, 60°00'31.5"W; 44.3 m a.s.l.; 19 Jul. 2025; Luan Mazzeo leg. https://www.inaturalist.org/observations/299289282 • 1 nymph; Amazonas state, Manaus city, Bosque da Ciência – INPA – Instituto Nacional de Pesquisa da Amazonia; 3°05'52.0"S, 59°59'10.8"W; 85.4 m a.s.l.; 03 Aug. 2025; Divya Mudappa leg. https://www.inaturalist.org/observations/303560174

The first confirmed citizen-science records of praying mantises belonging to the genus *Odontomantis* in Brazilian territory come from the international airport of Boa Vista, in the state of Roraima, during 2023. While these constitute the earliest published and verifiable records, unpublished data suggest that *Odontomantis* may have been present in Manaus, in the state of Amazonas, prior to its detection in Boa Vista (Projeto Mantis, personal communications). The Boa Vista records, supported by photographic material of sufficient quality for identification, unequivocally documented the presence of live specimens, sometimes active on ornamental vegetation in areas adjacent to the airport infrastructure. Subsequently, over the following months, similar records were made in various other locations within the city of Boa Vista, both in central areas and peripheral neighborhoods. These observations, originating from multiple independent sources, involved individuals at different developmental stages, including adult males and females, nymphs of varying sizes, and first-instar nymphs. The photographic and video documentation collected shows a consistent year-round presence, with specimens found in every season and no evidence of periods lacking observations. Alongside the spread of records within the main urban area, the presence of *Odontomantis* was also documented in other settlements in the state of Roraima. In particular, photographic confirmation of the species was obtained in small urban and peri-urban centers, often characterized by ornamental vegetation and private gardens. In these contexts, mantises were observed both on artificial structures and on shrubby plants and broad-leaved trees. Some photographs from residential areas show adult individuals positioned on exterior house walls, metal fences, ornamental pots, and railings, while others depict mid-instar nymphs (likely L3–L5) on dense foliage close to the ground. From 2024 onward, records began to include the city of Manaus in the state of Amazonas. In this large urban center, *Odontomantis* was detected in several neighborhoods, both in densely populated areas and in peripheral zones with green spaces. The distribution of records in Manaus is broad and includes both residential areas and public parks. A particularly notable case in terms of completeness of documentation was recorded in the Cidade Nova neighborhood, where an adult female *Odontomantis* was observed and photographed depositing an ootheca on the plastic frame of an irrigation system (Fig. 1). The observational sequence was completed with further images taken at a later date showing the hatching of the ootheca with the emergence of at least 25 first-instar nymphs (L1). These clear and well-dated images represent the first confirmed documentation of ootheca deposition and hatching of *Odontomantis* in Brazil. Across the set of observations collected, the presence of the species was confirmed in every month of the year without interruption between seasonal periods. Both adult males and females were recorded in all seasons, as well as nymphs at different developmental stages, indicating the temporal coexistence of multiple generations or overlapping cohorts. In several locations in Boa Vista and Manaus, as well as in small towns in the state of Roraima, records show a clear variety of microhabitats. Most individuals were observed in urban and peri-urban contexts. Photographs from residential areas frequently show mantises on native and ornamental plants commonly used for garden and courtyard decoration, including broad-leaved species that provide a suitable substrate and area for camouflage. In several cases, individuals were photographed on dense shrubs or on isolated leaves of ornamental plants located along fences or at the edges of pathways. In at least two records from Boa Vista, specimens were found on low-growing plants at an average height of between 0.5 and 1.2 meters above the ground.

Appearance and life cycle.—During post-embryonic development, the individual passes through a sequence of morphologically distinct stages. In the first instar, the body is black with green bands along the margins of each thoracic segment, giving it an appearance reminiscent of black ants. In the second instar, the coloration remains black, but the coxa and tibia of the raptorial legs, as well as the femora of the mid and hind legs, take on a brownish or reddish hue. In the third instar, the body is brown or black, while the legs become yellow or green. In the fourth instar, the body is brown or green, and preliminary sexual differences can be observed: Males exhibit eight abdominal segments, females six; in both sexes, wing buds are still absent. In subadult stages, the body turns green and wing buds appear, becoming prominent shortly before the final molt; in males, black spots can be observed on the dorsal side of the first two abdominal segments, whereas in

Fig. 1. Photographic documentation of *Odontomantis* sp. in the state of Amazonas, Brazil. **A.** An adult female is shown depositing an ootheca on a plastic component of an irrigation system in the Cidade Nova neighborhood, Manaus. **B.** The same ootheca from A at the time of hatching, with numerous first-instar nymphs (L1) emerging. Photo credit Thalisson Torres. **C.** A nymph is observed on the leaf of an ornamental plant in the urban area of the Adrianópolis neighborhood, Manaus, photo by Luan Mazzeo. **D.** A nymph is documented in the Bosque da Ciência (INPA), a peri-urban green area adjacent to the city of Manaus, photo by Divya Mudappa.

females the wing buds are more developed. In the sixth female instar, the body is yellowish-green, the wing buds are well developed, and the ovipositor is clearly visible. In adults, both sexes retain a green body color but display differentiated wings: In males, the tegmina are dark green with a brownish margin, and the hindwings show a golden anterior region and a blackish posterior region; in females, the tegmina just after the final molt are green with yellowish costal margin, while the hindwings are golden anteriorly and brown posteriorly. This developmental and color variation pattern is very similar to what was reported for *Odontomantis planiceps* (Saha and Chanda 2023). However, due to the lack of an adequate taxonomy for the genus *Odontomantis* and the limited material examined, it is not possible to determine with certainty the exact species of *Odontomantis* introduced in Brazilian territory.

Discussion

The introduction of alien invasive species represents a pervasive phenomenon that transcends geographical and climatic boundaries, affecting ecosystems on every continent and in virtually all biomes, including tropical regions that have often been mistakenly perceived as more resistant due to their high biodiversity and ecological complexity. In reality, the tropics are particularly vulnerable to biological invasions (Rojas-Sandoval et al. 2022), especially from species originating in regions with comparable climatic regimes, where organisms have evolved under similar environmental pressures. This susceptibility is amplified by processes of evolutionary convergence in which unrelated taxa from different continents develop analogous morphological, physiological, and behavioral adaptations in response to parallel ecological niches (Svenson 2007, Wieland 2010). Consequently, when species from climatically and structurally similar habitats are introduced into new tropical environments, the pre-adaptations they carry can facilitate rapid acclimatization, ecological establishment, and eventual proliferation. Such invasions are not merely theoretical possibilities but well-documented realities, with numerous cases involving plants, invertebrates, vertebrates, and microorganisms whose ecological roles overlap with those of native species, creating potential for competition, hybridization, and alteration of ecosystem dynamics (Pyšek and Richardson 2010).

By contrast, the observed frequency of mantid introductions in tropical areas appears lower in the available literature, but this apparent rarity is most likely the result of a strong detection and publication bias: Many tropical regions are less studied due to logistical constraints, environmental and geopolitical risks, and the lower density of researchers and monitoring networks, leading to an underestimation of introduction and establishment events that may occur without being documented. In this context, it is necessary to distinguish perception from empirical reality: the greater visibility of introductions in temperate regions may reflect both intrinsic characteristics of the invading species (ecological plasticity, broad diet, and high reproductive potential) and differences in detection and study capacity by the scientific community and local observers. In Southeast Asia, where species of *Odontomantis* are natively abundant (Wu 2021a, Otte et al. 2025), regional reports sometimes indicate high local density in favorable habitats (Bragg 2021), a factor that may facilitate accidental transport and introduction via plant trade or ornamental plant exchanges. The occurrence of such abundant, small-bodied, ant-mimicking mantids in anthropized areas of Asia provides a plausible source pool for unintentional introductions to other continents.

In this global context, the arrival of *Odontomantis* species in Brazil stands as an instructive and concerning case study, particularly because this genus is typically native to Asia and its introduction through natural dispersal mechanisms, such as wind-borne dispersal, rafting on vegetation mats, or passive transport via migratory birds, appears highly improbable given the vast geographical and oceanic distances involved. Instead, the available evidence strongly supports the hypothesis that their introduction was human-mediated, a pathway that has been repeatedly documented for a range of other Mantodea (Fasano and De Martino 2023) and insect taxa. Over the past two decades, the volume of goods imported from Asia to Brazil has risen dramatically, driven by intensified trade relations with key partners. China, currently Brazil's leading commercial partner (Bustelo and Reis 2019), not only dominates the bilateral trade balance but is also home to at least twelve described species of *Odontomantis* (Wu 2021b). India, another major contributor to Brazil's import–export flows (Baumann et al. 2021), harbors no fewer than four species of the genus (Singh et al. 2016). Given these figures and considering the diverse array of commodities exchanged, from ornamental plants and cut flowers to wooden products, agricultural goods, and industrial materials, the potential for inadvertent transport of live insects or their eggs is far from negligible. The introduction of exotic insects often requires only minimal biological material: A single ootheca containing viable eggs, a gravid female, or even a small pair of adult specimens can suffice to establish a founding population (Battiston et al. 2020a). This mode of accidental introduction has been confirmed in numerous analog cases worldwide (Battiston et al. 2020b), where the resilience of mantis oothecae to environmental stressors has enabled them to survive long-distance transportation.

In the case of *Odontomantis* in Brazil, the first confirmed observations originated from Boa Vista International Airport, a logistical hub with cargo traffic capable of facilitating the import of goods bearing concealed oothecae or live individuals. The location is critical to the introduction narrative, as Boa Vista is geographically positioned to serve as a primary entry point for air cargo arriving from overseas, particularly from Asian countries. Following their likely arrival at this gateway, individuals could have been transported overland to Manaus via the BR-174/AM (Fig. 2), a major longitudinal highway that traverses the Brazilian states of Mato Grosso, Rondônia, Amazonas, and Roraima, extending northwards to Venezuela. This route is not only the sole terrestrial connection between Roraima and the rest of Brazil but also a corridor whose environmental impact has been well documented. Recent studies have demonstrated that road construction and maintenance in the Amazon are closely linked to deforestation processes, as they promote human settlement, facilitate land occupation for agriculture and livestock, and encourage logging activities. These anthropogenic disturbances fragment habitats, alter microclimatic conditions, and create novel ecological niches, often in degraded or peri-urban environments, that can be readily exploited by non-native species (Veras et al. 2023). In such settings, alien species may face reduced predation pressure, lower interspecific competition, and abundant resources, particularly in urbanized or semi-urbanized zones where vegetation remnants, gardens, and artificial structures offer suitable microhabitats.

Within the current known invasion range, *Odontomantis* species coexist with mantids belonging to families different from Hymenopodidae, namely Acanthopidae (sensu Schwarz and Roy 2019) and Acontistidae (sensu Rivera and Svenson 2020), yet sharing notable similarities in morphology, ecology, and behavior. Foremost among these are mantids of the genus *Tithrone* Stål, 1877, characterized by small adult body size, bright green coloration, a compact and robust form with a short pronotum, and a head bearing large, rounded eyes. Their forewings are opaque and oval when folded against the body, while their hindwings display vivid coloration that can serve in defensive displays. Ecologically, *Tithrone* species are typically found on shrub-level vegetation at intermediate heights, where adults can be observed throughout the year (Moulin 2025). Interestingly, first-instar nymphs (L1) exhibit ant-mimicking morphology and behavior, a defensive adaptation likely to deter visually hunting predators. These ecological parallels raise substantial questions regarding potential interspecific competition between *Odontomantis* and *Tithrone*, as well as with other similarly sized and ecologically comparable mantids such as those in the genera *Paratithrone* Lombardo, 1996 and *Acontista* Saussure, 1872. Possible outcomes of such interactions include

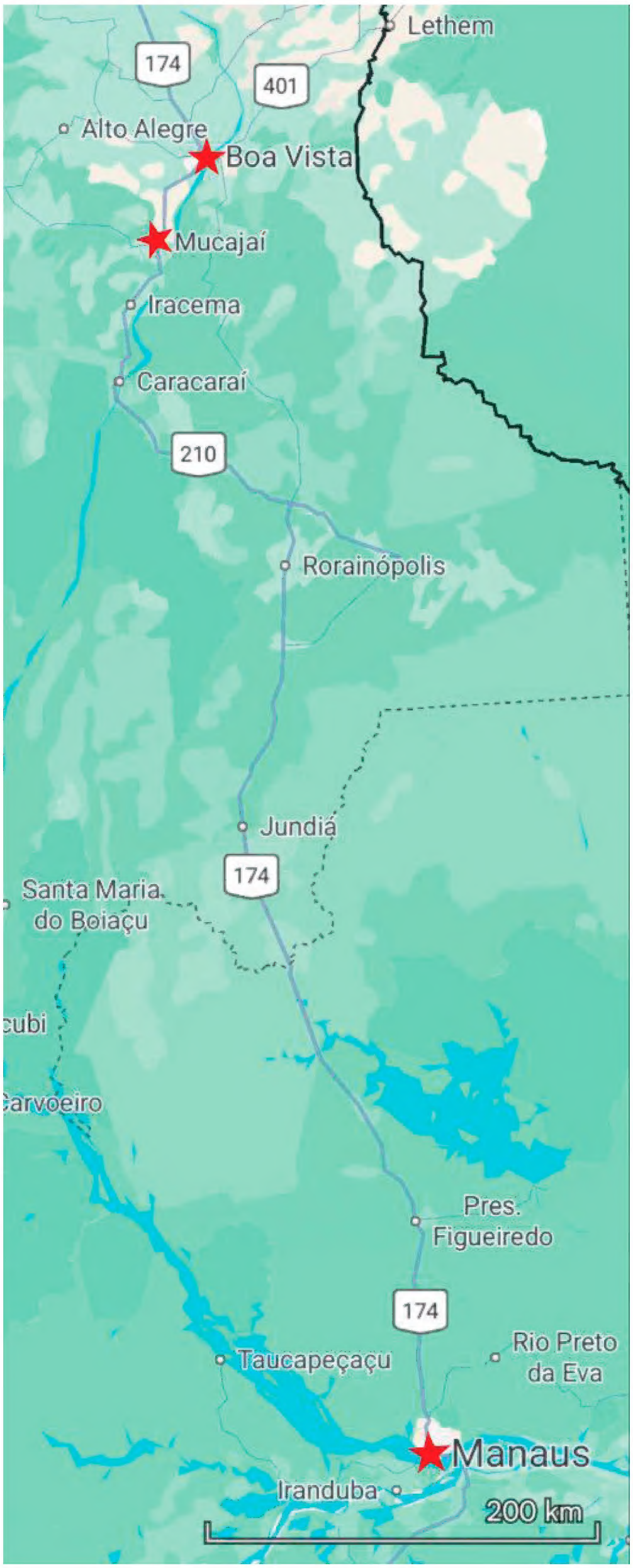

Fig. 2. The area of Brazil currently affected by the presence of non-native mantids of the genus *Odontomantis*. The red stars indicate the locations of sightings. Note the BR-174 highway connecting Boa Vista (Roraima state) to Manaus (Amazonas state). Base map from Google Earth 2025 © Google.

competitive exclusion, niche displacement, and shifts in local prey population dynamics, which could have cascading effects on the arthropod community and associated trophic networks.

Broader biogeographical reflections are also warranted. The similarities between *Odontomantis* and Neotropical taxa such as *Tithrone* highlight an intriguing case of convergent evolution in which unrelated lineages occupying distant continents have developed analogous ecomorphs adapted to shrub-level vegetation, small body size, and ant-mimicking early instars. This convergence not only underscores the adaptive value of these traits but also raises concerns that alien *Odontomantis* may successfully exploit ecological niches already filled by Neotropical analogs, intensifying the risk of direct competition. Moreover, the known high local abundances of *Odontomantis* in Southeast Asia (Bragg 2021) suggest that, should similar densities be achieved in Brazilian habitats, their ecological impact could be amplified, potentially disrupting trophic interactions and altering arthropod community composition.

Addressing these questions will require targeted research, beginning with a comprehensive survey to determine whether the invasion remains restricted to the primary urban centers of Roraima and Amazonas or whether it extends into surrounding forested areas. Field sampling and collection of live specimens will be essential for accurate taxonomic identification, particularly given the current limitations in the taxonomy of the genus *Odontomantis*. The lack of a robust taxonomic framework and the minimal amount of collected material presently hinder efforts to determine the exact species or species complex introduced into Brazilian territory. This is especially significant considering that *Odontomantis planiceps*—a species whose life cycle and nymphal development have been documented in detail by Saha and Chanda (2023)—is only one of several candidates that could match the observed morphology, underscoring the importance of refining species-level diagnostics.

Equally important will be the inspection of imported goods, particularly those originating from regions known to harbor *Odontomantis*, as well as the integration of customs inspections with entomological expertise to enhance early detection capabilities. Beyond species identification, ecological research should focus on quantifying the overlap in habitat use, prey selection, and seasonal phenology between alien and native mantids, as well as investigating the potential for indirect interactions such as shared predator avoidance strategies or attraction of common parasitoids. Public engagement will also be a critical component of any management strategy: Citizen science initiatives can substantially increase detection rates and generate valuable occurrence data, while awareness campaigns can reduce unintentional human-assisted spread within national borders. European models for public participation in invasive species monitoring and management, such as those described by Battiston et al. (2024), offer valuable templates that could be adapted to the Brazilian context, particularly in urban and peri-urban areas where human–mantis encounters are most likely.

Given the mobility of goods and people within the Amazonian region and the complex socio-economic factors driving land use change, proactive measures are required to prevent the establishment and spread of *Odontomantis* populations beyond their current range. The author thus emphasizes the urgent need for an integrated research and management program combining field surveys, taxonomic resolution, ecological assessment, trade monitoring, and public involvement, both to mitigate the potential ecological impacts of this invasion and to contribute to the broader understanding of how tropical ecosystems respond to the introduction of morphologically and behaviorally convergent predatory insects.

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